

Application Number 09/900,514
Responsive to Office Action mailed August 15, 2005

REMARKS

This amendment is responsive to the Final Office Action dated August 15, 2005. Applicants have amended claims 15, 22, 25, 37 and 38. Applicants have added claims 39 and 40. Accordingly, claims 1-40 are pending upon entry of this amendment.

Claim Rejection Under 35 U.S.C. § 103

Claims 1-3, 5-14 and 25-28

In the Final Office Action, the Examiner rejected claims 1-3, 5-14 and 25-38 under 35 U.S.C. 103(a) as being unpatentable over Dai et al. (USPN 6,658,016) in view of Lu (USPN 6,480,911). Applicants respectfully traverse the rejection. The applied references fail to disclose or suggest the inventions defined by Applicants' claims, and provide no teaching that would have suggested the desirability of modification to arrive at the claimed invention.

For example, neither Dai et al. (Dai) nor Lu, either singularly or in combination, teach or suggest a set of input ports to receive data packets for a plurality of priority levels, a set of sink ports coupled to said set of input ports to receive and forward said data packets, and a set of data rings coupling said set of input ports and said set of sink ports, wherein one of the sink ports calculates a weighted average bandwidth for each of the priority levels and rejects packet data when the weighted average bandwidth for at least two of the priority levels exceeds a predetermined value, as recited by Applicants' independent claims 1 and 36.

Further, Dai and Lu, either singularly or in combination, also fail to describe receiving a set of data packets for a plurality of priority levels, transferring said set of data packets to a set of data rings, wherein a set of sink ports is coupled to said set of data rings, and one of the sink ports calculating a weighted average bandwidth for each of the priority levels and rejecting packet data when an amount of packet data exceeds a threshold and the weighted average bandwidth for at least two of the priority levels exceeds a predetermined value, as recited by Applicants' amended independent claims 25, 37 and 38.

In support of the rejection, the Examiner stated that Dai teach an apparatus comprising a set of input ports to receive data packets, a set of sink ports coupled to said set of input ports to receive and forward said data packets, and a set of data rings coupling said set of input ports and said set of sink ports. The Examiner correctly recognized that Dai fail to teach input ports

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receiving data packets for a plurality of priority levels, and that at least one of the sink ports calculates a weighted average bandwidth for each of the priority levels and rejects packet data when the weighted average bandwidth for at least two of the priority levels exceeds a predetermined value. However, the Examiner asserted that Lu teaches these features and that at the time of Applicants' invention it would have been obvious to one of ordinary skill in the art to modify the apparatus of Dai with the queue management method of Lu.

Applicants disagree with the Examiner's position for several reasons. First, contrary to the Examiner's assertion, Dai fail to describe *an apparatus* having a set of data rings coupling the set of input ports and the set of sink ports *within that apparatus*. Instead, Dai describe a packet switching fabric in which a plurality of switching devices are coupled in a ring fashion. The Dai switch fabric is properly viewed as a ring of switches. For example, FIG. 1 of Dai illustrates four distinct switching devices 12 coupled in a ring-like manner using an external data ring 18 and a control ring 24. The data ring 18 includes a plurality of data ring segments each coupling a corresponding adjacent pair of the devices together to ultimately form a ring.

In the Dai switch fabric, packets may propagate from switch to switch and ultimately may traverse the ring of switches. As can be seen by FIG. 1, to traverse the ring, a packet must be sequentially propagated by each of the switches. Each of switches 12 in the ring is a separate switch having input and output (sink) ports, and further includes ring interface circuitry so that the switches may be interconnected to form an overall ring of switches.

In contrast, Applicants describe and claim a single apparatus, e.g., a cross-bar switch, in which the apparatus itself includes data rings for transferring packets directly between the input ports and the output (sink) ports of that same apparatus. For purposes of clarity, Applicants refer the Examiner to Figure 2 of the present application that illustrates exemplary internal architecture of Applicants' described apparatus. When properly viewed, the Dai switches that may be connected to form a "ring" are fundamentally different from the internal apparatus architecture described and claimed by the Applicants. Dai fail to teach or suggest that the internal architecture of any of the switches comprises a ring topology that connects the input ports and the output ports within the individual switch. Thus, the Examiner is incorrect when asserting that Dai teach an apparatus comprising a set of input ports to receive data packets, a set of sink ports

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coupled to said set of input ports to receive and forward said data packets, and a set of data rings coupling said set of input ports and said set of sink ports.

Second, Lu fails to describe a sink port that calculates a weighted average bandwidth for each of the priority levels and rejects packet data when the weighted average bandwidth for at least two of the priority levels exceeds a predetermined value. Instead, Lu teaches a class queuing system that receives data packets in a lowest level queue and moves the data packets to higher level queues based on a class, e.g., high, medium and low, of the data packets and a weight based scheduling scheme.¹ A weight based scheduling scheme may operate in cycles where for each cycle a number of data packets is selected for transfer to a higher level queue based on the weights of the weight set.² For example, col. 6, ll. 43-48 of Lu describes an exemplary weight set applied to data packets of different class levels.

If the second weight set is: high class=5; medium class=2; and low class=1, then five data packets from the high class final class queue 444 is transferred to the destination output queue 328 for two data packets of the medium class final class queue 442 and for one data packet of the low class final queue 440.

Applying a weight based *scheduling scheme* to data packets of different class levels does not include calculating a *weighted average bandwidth* for each of the priority levels, as required by Applicants' claims 1 and 36. The weights described in the Lu reference merely comprise a number of packets transferred from a particular class queue to a higher level queue. By no means is this any form of a "weighted average." Nothing in Lu describes a weighted average. Moreover, Lu makes no mention of calculating a weighted average bandwidth for each data packet priority level. In addition, Lu does not describe rejecting packet data when the weighted average bandwidth for at least two of the priority levels exceeds a predetermined value. The Lu scheduling scheme is just that, a scheduling scheme. According to the scheduling scheme, packets are moved up in priority based on a weight associated with the class of the packet. Thus, contrary to the Examiner's assertion, Lu fails to teach calculating a weighted average bandwidth for each of the priority levels and rejecting packet data when the weighted average bandwidth for at least two of the priority levels exceeds a predetermined value.

¹ Lu, Col. 4, ll. 40-60.

² Lu, Col. 6, ll. 32-34.

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Neither Dai nor Lu, either singularly or in combination, teach or suggest each and every feature of Applicants' independent claims 1, 25, 36, 37 and 38. As shown above, neither Dai nor Lu describe a set of data rings coupling a set of input ports and a set of sink ports within an individual apparatus, such as a cross-bar switch. In addition, neither Dai nor Lu describe calculating a weighted average bandwidth for each data packet priority level received by the set of input ports and rejecting data packets based on the weighted average bandwidth. Therefore, even if the packet switching fabric of Dai were modified by the queue management method of Lu it would not result in Applicants' claimed invention.

Dai and Lu similarly fail to disclose the features required by Applicants' dependent claim 2. Applicants' claim 2 recites that said set of data rings couples each sink port in said set of sink ports to each input port in said set of input ports. In support of the rejection, the Examiner cited col. 7, ll. 35-39 of Dai. However this passage states that a data packet is received at a network port of a source one of the switching devices and transmitted from a network port of a destination one of the switching devices that is communicatively coupled to the source device via the data ring. As discussed above, Dai do not teach the data ring coupling each sink port to each input port within the individual apparatus, but instead teach a data ring coupling separate apparatuses together. For at least the reasons described above in reference to independent claims 1 and 36, Applicants' dependent claims 2, 3, 5-14, and 26-35 are also allowable.

Claims 15-24

In the Final Office Action, the Examiner rejected claims 15-24 under 35 U.S.C. 103(a) as being unpatentable over Carlson (USPN 6,728,206) in view of Lu. Applicants respectfully traverse the rejection. The applied references fail to disclose or suggest the inventions defined by Applicants' claims, and provide no teaching that would have suggested the desirability of modification to arrive at the claimed invention.

For example, neither Carlson nor Lu, either singularly or in combination, teach or suggest a cross-bar switch that includes a set of input ports to receive data packets from a communications link for a plurality of priority levels, a set of sink ports coupled to said set of input ports to receive said data packets from said set of input ports, and a set of data rings coupling each sink port in said set of sink ports to each input port in said set of input ports,

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wherein one of the sink ports calculates a weighted average bandwidth for each of the priority levels and rejects packet data when an amount of packet data exceeds a threshold and the weighted average bandwidth for at least two of the priority levels exceeds a predetermined value, as recited by Applicants' amended independent claims 15 and 22.

In support of the rejection, the Examiner stated that Carlson teaches a cross-bar switch comprising a set of input ports to receive data packets, a set of sink ports coupled to said set of input ports to receive said data packets, and a set of data rings coupling each input port to each sink port. The Examiner correctly recognized that Carlson fails to teach input ports receiving data packets from a communications link for a plurality of priority levels. The Examiner further recognized that Carlson fails to teach a cross-bar switch in which one of the sink ports calculates a weighted average bandwidth for each of the priority levels and rejects packet data when an amount of packet data exceeds a threshold and the weighted average bandwidth for at least two of the priority levels exceeds a predetermined value. However, the Examiner asserted that Lu teaches these features and that at the time of Applicants' invention it would have been obvious to one of ordinary skill in the art to modify the cross-bar switch of Carlson with the queue management method of Lu.

As described above, Lu fails to describe a sink port that calculates a weighted average bandwidth for each of the priority levels and rejects packet data when an amount of packet data exceeds a threshold and the weighted average bandwidth for at least two of the priority levels exceeds a predetermined value. Instead, Lu teaches a class queuing system that receives data packets in a lowest level queue and moves the data packets to higher level queues based on a class, e.g., high, medium and low, of the data packets and a weight based scheduling scheme.³ A weight based scheduling scheme may operate in cycles where for each cycle a number of data packets is selected for transfer to a higher level queue based on the weights of the weight set.⁴

Applying a weight based scheduling scheme to data packets of different class levels does not include calculating a weighted average bandwidth for each of the priority levels, as required by Applicants' claims 1 and 36. The weights described in the Lu reference merely comprise a number of packets transferred from a particular class queue to a higher level queue. Lu makes no

³ Lu, Col. 4, ll. 40-60.

⁴ Lu, Col. 6, ll. 32-34.

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mention of calculating a weighted average bandwidth for each data packet priority level. In addition, Lu does not describe rejecting packet data when the weighted average bandwidth for at least two of the priority levels exceeds a predetermined value.

Neither Carlson nor Lu, either singularly or in combination, teach or suggest each and every feature of Applicants' independent claims 15 and 22. For example, neither Carlson nor Lu describe calculating a weighted average bandwidth for each data packet priority level received by the set of input ports and rejecting data packets based on the weighted average bandwidth. Therefore, even if the cross-bar switch of Carlson were modified by the queue management method of Lu it would not result in Applicants' claimed invention. For at least the reasons described above in reference to independent claims 15 and 22, Applicants' dependent claims 16-21 and 23-34 are also allowable.

Claim 4

In the Final Office Action, the Examiner rejected dependent claim 4 under 35 U.S.C. 103(a) as being unpatentable over Dai in view of Lu and further in view of Yamamoto et al. (USPN 6,392,991). Applicants respectfully traverse the rejection. The applied references fail to disclose or suggest the inventions defined by Applicants' claims, and provide no teaching that would have suggested the desirability of modification to arrive at the claimed invention.

Dai, Lu and Yamamoto et al. (Yamamoto), either singularly or in combination, fail to describe each and every feature of Applicants' independent claim 1 with said set of data rings including three rings, as recited by Applicants' dependent claim 4. As described above, both Dai and Lu fail to teach a sink port that calculates a weighted average bandwidth for each of the priority levels and rejects packet data when the weighted average bandwidth for at least two of the priority levels exceeds a predetermined value. Yamamoto provides no teaching capable of overcoming the deficiencies of both Dai and Lu.

For at least these reasons, the Examiner has failed to establish a prima facie case for non-patentability of Applicant's claims 1-38 under 35 U.S.C. 103(a). Withdrawal of this rejection is requested.

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Rejection for Obviousness-type Double Patenting:

The Examiner provisionally rejected claims 1, 15, 22, 25, 36 and 37 under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 59 and 72 of copending Application No. 10/036,595.

Applicants note the provisional status of this rejection. Accordingly, Applicants will address this issue if and when the rejection is formally applied.

New Claims:

Applicant has added claims 39 and 40 to the pending application. The applied references fail to disclose or suggest the inventions defined by Applicant's new claims, and provide no teaching that would have suggested the desirability of modification to arrive at the claimed inventions. As one example, the reference fail to disclose or suggest each and every feature of Applicants' claim 1, wherein the bandwidth allocation circuit rejects packet data having the first priority level in said plurality of priority levels when an amount of packet data exceeds a threshold, as recited by claim 39. As another example, the references fail to disclose or suggest each and every feature of Applicants' claim 36, wherein the determining means rejects packet data when an amount of packet data exceeds a threshold, as recited by claim 40. No new matter has been added by the new claims. Support can be found throughout the present application, including pages 30-33.

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CONCLUSION

All claims in this application are in condition for allowance. Applicant respectfully requests reconsideration and prompt allowance of all pending claims. Please charge any additional fees or credit any overpayment to deposit account number 50-1778. The Examiner is invited to telephone the below-signed attorney to discuss this application.

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